

CLAIMS

1. A method for processing an image, the method comprising:
 - determining a first tone value for a location within the image based upon
5 attributes of pixels within a first neighborhood surrounding the location, the first tone
value specifying a local weight for a first tone adjustment in the image;
 - determining a second tone value for the location based upon attributes of
pixels within a second neighborhood surrounding the location, the second tone value
specifying a local weight for a second tone adjustment in the image; and
 - 10 adjusting the image at the location using the first and second tone adjustments
according to the local weights specified by the first and second tone values,
respectively.
2. The method of claim 1, wherein:
 - 15 the first tone value or the second tone value is determined based upon a
neighborhood intensity that is a measure of values of a local attribute specified by
pixels within the first or second neighborhood, respectively.
3. The method of claim 2, wherein:
 - for each pixel in the corresponding neighborhood, the value of the local
attribute depends on luminosity of the pixel.
- 20 4. The method of claim 2, wherein:
 - for each pixel in the corresponding neighborhood, the value of the local
attribute depends on a maximum color value of the pixel.
5. The method of claim 2, wherein:
 - 25 for each pixel in the corresponding neighborhood, the value of the local
attribute is a weighted average of a luminosity and a maximum color value of the
pixel.

6. The method of claim 2, wherein:

the neighborhood intensity is determined by averaging the values of the local attribute for pixels within the corresponding neighborhood.

7. The method of claim 6, wherein:

5 averaging the values of the local attribute for pixels within the corresponding neighborhood includes averaging the values of the local attribute according to gaussian weights that are assigned to each pixel in the neighborhood based upon a distance between the pixel and the location.

8. The method of claim 6, wherein:

10 averaging the values of the local attribute for pixels within the corresponding neighborhood includes averaging the values of the local attribute according to weights that are assigned to each pixel in the neighborhood based upon a difference between the local attribute at the pixel and the location.

9. The method of claim 2, further comprising:

15 receiving user input selecting a range of the neighborhood intensity for which the first or second tone value is substantially different from a reference value.

10. The method of claim 2, wherein the first or second tone value is specified by a first or second tone function of the neighborhood intensity, respectively, the method further comprising:

20 receiving user input specifying a functional shape for the first or second tone function.

11. The method of claim 1, wherein:

the first neighborhood and the second neighborhood are substantially identical.

25 12. The method of claim 1, further comprising:

identifying a graphics object within the image, the location lying inside the

graphics object; and

restricting the first and second neighborhoods inside the graphics object.

13. The method of claim 12, wherein:

identifying the graphics object includes identifying lines or edges in the
5 image.

14. The method of claim 1, further comprising:

determining one or more additional tone values for the location, each of the
additional tone values specifying a local weight for a corresponding tone adjustment
in the image; and

10 wherein adjusting the image at the location includes using each of the
additional tone adjustments according to the corresponding tone value.

15. The method of claim 14, wherein:

at least one of the additional tone values is determined based on the first and
second tone values.

16. The method of claim 1, further comprising:

receiving user input specifying a characteristic size of the first neighborhood
or the second neighborhood.

17. The method of claim 1, further comprising:

receiving user input specifying a strength for the first or second tone
20 adjustment.

18. The method of claim 1, wherein the first and second tone adjustments are related to
each other by a negative symmetry.

19. A system for image processing, the system comprising:

a local adjustment tool to adjust an image including a plurality of pixels, the
25 local adjustment tool including two or more tone components, each tone component

specifying a tone adjustment and configured to determine a tone value for a location within the image based upon attributes of pixels within a neighborhood surrounding the location, each tone value specifying a local weight for the corresponding tone adjustment, the local adjustment tool configured to adjust the image at the location using the tone adjustments according to the local weights specified by the corresponding tone values.

20. The system of claim 19, further comprising:

an image capturing device to generate the image.

21. The system of claim 20, wherein the image capturing device includes a digital camera or a scanner.

22. The system of claim 19, further comprising:

a display device to display the image.

23. The system of claim 22, wherein the display device is implemented in a portable device.

24. The system of claim 19, wherein at least one of the tone components specifies an adjustment parameter for the corresponding tone adjustment, the system further comprising:

a user interface to set a value for the adjustment parameter.

25. A software product, tangibly embodied in a machine-readable medium, for processing an image, the software product comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

determining a first tone value for a location within the image based upon attributes of pixels within a first neighborhood surrounding the location, the first tone value specifying a local weight for a first tone adjustment in the image;

determining a second tone value for the location based upon attributes of pixels within a second neighborhood surrounding the location, the second tone value

specifying a local weight for a second tone adjustment in the image; and
 adjusting the image at the location using the first and second tone adjustments
 according to the local weights specified by the first and second tone values,
 respectively.

5 26. The software product of claim 25, wherein:

the first tone value or the second tone value is determined based upon a
 neighborhood intensity that is a measure of values of a local attribute specified by
 pixels within the first or second neighborhood, respectively.

27. The software product of claim 26, wherein:

10 for each pixel in the corresponding neighborhood, the value of the local
 attribute depends on luminosity of the pixel.

28. The software product of claim 26, wherein:

for each pixel in the corresponding neighborhood, the value of the local
 attribute depends on a maximum color value of the pixel.

15 29. The software product of claim 26, wherein:

for each pixel in the corresponding neighborhood, the value of the local
 attribute is a weighted average of a luminosity and a maximum color value of the
 pixel.

30. The software product of claim 26, wherein:

20 the neighborhood intensity is determined by averaging the values of the local
 attribute for pixels within the corresponding neighborhood.

31. The software product of claim 30, wherein:

averaging the values of the local attribute for pixels within the corresponding
 neighborhood includes averaging the values of the local attribute according to
 gaussian weights that are assigned to each pixel in the neighborhood based upon a
 25 distance between the pixel and the location.

32. The software product of claim 30, wherein:

averaging the values of the local attribute for pixels within the corresponding neighborhood includes averaging the values of the local attribute according to weights that are assigned to each pixel in the neighborhood based upon a difference between the local attribute at the pixel and the location.

33. The software product of claim 26, further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

receiving user input selecting a range of the neighborhood intensity for which the first or second tone value is substantially different from a reference value.

34. The software product of claim 26, wherein the first or second tone value is specified by a first or second tone function of the neighborhood intensity, respectively, the software product further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

receiving user input specifying a functional shape for the first or second tone function.

35. The software product of claim 25, wherein:

the first neighborhood and the second neighborhood are substantially identical.

36. The software product of claim 25, further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

identifying a graphics object within the image, the location lying inside the graphics object; and

restricting the first and second neighborhoods inside the graphics object.

37. The software product of claim 36, wherein:

identifying the graphics object includes identifying lines or edges in the image.

38. The software product of claim 25, further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

5 determining one or more additional tone values for the location, each of the additional tone values specifying a local weight for a corresponding tone adjustment in the image; and

 wherein adjusting the image at the location includes using each of the additional tone adjustments according to the corresponding tone value.

39. The software product of claim 38, wherein:

10 at least one of the additional tone values is determined based on the first and second tone values.

40. The software product of claim 25, further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

 receiving user input specifying a characteristic size of the first neighborhood or the second neighborhood.

15 41. The software product of claim 25, further comprising instructions operable to cause one or more data processing apparatus to perform operations comprising:

 receiving user input specifying a strength for the first or second tone adjustment.

20 42. The software product of claim 25, wherein the first and second tone adjustments are related to each other by a negative symmetry.